The Meteorological Magazine

Air Ministry :: Meteorological Office

Vol. 56

Nov. 1921

No. 670

LONDON : PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

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Audibility of the Oppau Explosion in England.

A GREAT explosion took place at the works of the Badische Anilin und Sodafabrik at Oppau, at 7 h. 32 m. Central European Time, on the morning of September 21st last. Oppau is situated in the Bavarian Palatinate, about 3 miles north-west of Mannheim. It is clear from statements in the Press that the destruction caused in Mannheim was considerable, and that the shock was felt in Munich, 175 miles away. From Oppau to Dover is only twice as far, and it therefore seemed possible that the sound produced by the explosion might have been sufficiently loud to be heard in England.

The audibility of explosions at great distances has been discussed by several writers. It often happens that the region in which the sound is audible is composed of two or more parts, separated from one another by a region in which it is certain that no sound was heard. Sometimes, again, there is an isolated region of silence in the middle of a region of audibility. The chief suggested explanations of these phenomena are those of Fujiwhara and von dem Borne. Fujiwhara's theory is that the velocity of the wind is the controlling factor. If we suppose the wind is from the east and increases in velocity with height, and consider sound waves propagated in a westerly direction, we see that the upper parts of the wave-fronts travel faster than the lower and consequently the wave-fronts tend to lean forward. Thus

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the sound is propagated in the lower layers of the atmosphere. On the other hand, if the wave is travelling towards the east, the wind distribution being the same, the sound travels fastest near the ground, and is therefore soon refracted upwards out of hearing. Hence, in such a case the region of audibility that surrounds the source would extend further to the west than to the east. If, however, there is a west wind above the east wind, the sound on the eastern side will be refracted down again when it reaches this wind, and there will be an isolated region of audibility to the east of the first. Fujiwhara has shown that in many cases of audibility at long distances the distribution of the sound can be accounted for by plausible assumptions about the vertical distribution of the wind at the time. To decide the question finally, however, it is necessary to have independent evidence about the vertical distribution of the wind, and hitherto the comparison has not been available.

On von dem Borne's theory, the effect is to be ascribed principally to the propagation of sound at much greater heights, where lighter gases predominate over nitrogen and oxygen. The velocity of sound is greater in hydrogen and helium, and consequently the downward bending of sound rays when they have reached a height of some scores of kilometres is to be expected.

The best method of testing these theories is by a direct comparison with the actual conditions, and for this reason a notice was inserted in the press by the Air Ministry asking for information from persons who heard the Oppau explosion. Up to the time of writing, 58 replies have been received. It is clear, however, that only a few of the sounds reported can have been caused by the explosion. Central European Time being the same as British Summer Time, the sound of the explosion should have been heard in London within a few minutes of 8 h. 5 m. B.S.T. Only four of the replies definitely refer to a time consistent with this, and even if we suppose that all of these really refer to the sound of the explosion, they are too few in number to determine the region of audibility.

An interesting feature of the replies was the number of circumstantial reports, mostly from London, of a noise heard about 7 h. 35 m. or 7 h. 45 m. These possibly refer to a single noise made near London. The time is consistent with the hypothesis that they were caused by a sound-wave from the Oppau explosion, travelling through the earth instead of the air, but previous records of audibility suggest that sound received in such a way is too feeble to be perceived.

Experience during the war showed that audibility of the firing on the Western Front in England was confined to the summer months. Mr. Miller Christy made careful observations at Chignal St. James, near Chelmsford, and his latest entries for the years 1915, 1916, 1917 and 1918* were on September 11th, August 15th, September 6th and August 26th respectively.

The Oppau explosion, occurring on September 21st, would seem to have been too late in the year to have been heard in England. No explanation of the seasonal variation in audibility has been worked out: it has been suggested by Whipple† that there may be air currents of the nature of monsoons at very great heights. Such currents would refract the sound downwards in the appropriate season in accordance with Fujiwhara's theory.

Great explosions, notably the Silvertown explosion of January 19, 1917, have been recorded in the past by barographs, and the records from the barographs and microbarographs at various British Stations have therefore been examined. No trace of any disturbance at the appropriate time has been observed. In view of the fact that the Silvertown explosion gave an increase of pressure of only about 1·5 mb. at Kew, it is not surprising that the Oppau explosion, at 30 times the distance, produced no noticeable effect.

Seismic records of the explosion were obtained at de Bilt and Strasbourg. H. J.

Long-Range Forecasts.

The issue by the Forecast Service of a Long-Range Forecast covering a fortnight has been the subject of much favourable comment and we are glad to be able to publish the following note by Mr. E. V. Newnham on the circumstances which justified the forecast. Two points of importance should be emphasized :—(1) That it is not at present possible to extend the "Further Outlook" to such long intervals as a general rule, and (2) That the method adopted is the systematic use of well-classified experience.

Note on the Long-Period Forecasts issued on September 26th and 28th. By E. V. Newnham, B.Sc.

On September 26th the pressure distribution over the British Isles and adjacent portions of the Continent was that classified by Gold, in *Geophysical Memoir* No. 16, as Type VIIIb., a large anticyclone being centred over the British Isles. This is obviously a very favourable type for

* *Q.J.R. Met. Soc.*, 1916, 1918, 1919.
† *Q.J.R. Met. Soc.*, 1918, p. 285

dry weather at any time of the year. Additional reasons existed for expecting prolonged fair weather on this occasion such as would not generally apply to other cases of Type VIIIB., nevertheless it is interesting to see what happened in past years when this type occurred in September without obviously unfavourable circumstances. Such occasions are

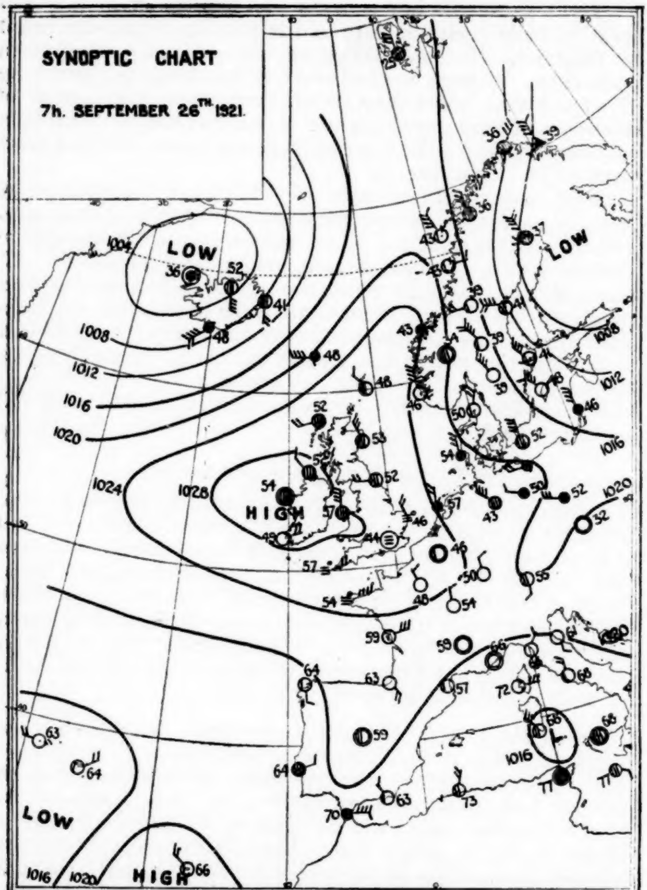


CHART FOR THE MORNING OF SEPTEMBER 26TH, 1921. TYPE VIIIB.

given in the following table.* The duration of "mainly fair" weather refers to the following stations south of the Mersey and Humber: Liverpool (Bidston), Holyhead, Pembroke, Portland, Dungeness, Dover, Yarmouth, Clacton, Nottingham, Bath, (or Falmouth), Oxford (or Benson) and London (Kew). The weather was taken to be "mainly fair" when no two of these stations reported 1 mm. or more of rain on two successive days.

Date.	Duration of "Mainly Fair" Weather. South of Mersey and Humber.	Time elapsing before complete Break-up South of Humber.	Notes.
	Days.	Days.	
Sept. 8th, 1907 -	23	23	Break up caused by depression from Atlantic.
Sept. 10th, 1910 -	4	20	Heavy rain in parts of East Anglia, 15th and 16th, otherwise rainless. Eventually depression from west of Ireland.
Sept. 22nd, 1910 -	8	—	
Sept. 4th, 1911 -	9	16	Rainless except temporary break 12th and 13th. Eventually depression from Atlantic.
Sept. 12th, 1912 -	16	17	Temporary break 28th and 29th, heavy rain latter date. Eventually depression from south-east.
Sept. 29th, 1914 -	16	16	V-shaped depression from Atlantic caused break up.
Sept. 7th, 1916 -	4	11	Partial break 10th and 11th. Eventually depression from south of Iceland.

The time elapsing before the complete break up of each fair spell over eastern England, south of the Humber (Dungeness, Dover, Yarmouth, Clacton, Nottingham, Oxford,

* Where Type VIIIB. reappeared during a fair spell this was not taken as an additional case to be investigated; adoption of this plan would have increased the number of examples to 20 and the average fair spell south of the Mersey and Humber to about 12 days, but undue weight would have been given to those years in which VIIIB. occurred several times in quite a short period.

It is worth mentioning that in the "mainly fair" spells here considered most stations experienced quite rainless weather.

and London), is also given in the table, a complete break up being taken to coincide with the recording of at least 1 mm. of rain at two or more of these stations on three successive days. It will be seen that in only one of the cases investigated did the break up in the specified area occur within a fortnight.

The forecast issued on September 26th, 1921, was as follows:—"Mainly fair and dry weather is probable for the next week or ten days over the southern half of the Kingdom." Two days later, when the information summarised above was available, the additional statement was made that:—"Over the eastern and central parts of England, south of the Humber, the chances are distinctly against a definite break up of these conditions within the next fortnight."

The following figures give an idea as to what happened during the 10 days covered by the first forecast:—

In the south of Ireland no appreciable rain (more accurately, not as much as 1 mm.) occurred until the sixth day, then definitely unsettled weather set in. At Holyhead and Liverpool there was complete absence of rain until the seventh day, except for 1 mm. only at Holyhead on the fifth day, and there was then a break up. In the south-west there was a temporary break in some places on the seventh and eighth days, in others on the seventh only. In the region of northern England including Nottingham and Cranwell (Lincs), appreciable rain fell on the eighth and ninth days only, but was exceedingly heavy on the eighth day (44 mm. at Cranwell and 25 mm. at Nottingham). At Benson (Oxon) and Clacton appreciable rain fell on the eighth day only. At South Farnborough, Kew, Dungeness, and Lympne no appreciable rain fell at all. At all stations except those in the extreme north the amount of bright sunshine was very large. At Lympne the total actually amounted to 100 hours. Over eastern and central England, south of the Humber, a definite break up had not occurred even at the time of writing (October 14th).

It will be seen that the 10-day forecast was not altogether successful for part of the area referred to, but that the 14-day forecast for the eastern counties was successful.

The large area covered by the working charts of to-day should make it possible to attempt further long-period forecasts of the general character of the weather from time to time. It seems not unreasonable to hope for greater success with these than with regular 24-hour forecasts of the detailed character of the weather, since the minor eccentricities of the weather which so often cause failure in a 24-hour forecast become relatively unimportant during the longer period.

OFFICIAL NOTICES.

Lectures on Meteorology.

In the September number of this magazine a provisional programme was published, of lectures and courses for the 1921–22 Session in the School of Meteorology, Imperial College of Science and Technology. With regard to the *Short Courses of Lectures on Technical Subjects* it is now announced that the order of courses (ii) and (iii) has been reversed. The course of four lectures by Dr. C. Chree, F.R.S., on Terrestrial Magnetism, 3.30 p.m. on Mondays, started on November 7th, and the course of three lectures by Sir Napier Shaw, F.R.S., on Wind above Clouds, will be given on Mondays at 3.30 p.m., beginning December 5th.

Spurn Head—Reinstallation of Anemograph and Sunshine Recorder.

At Spurn Head, the Dines anemograph and the Campbell-Stokes sunshine recorder have recently been reinstalled, and both are again in operation. These instruments which are in the care of the chief lightkeeper, were originally installed in February 1913, the site nearly at the end of the long narrow low spit of sand which forms the Head, being regarded as ideal for wind and sunshine measurements. From the meteorological point of view the exposure is probably the best that could be found in the United Kingdom, but the instruments suffered considerably during gales from the effects of blown sand, which is both fine and exceedingly "sharp." Notwithstanding the adoption of various devices to prevent it, sand found its way in large quantities into the wooden hut in which the recording portion of the anemometer was placed and so put the instrument out of action. In the case of the sunshine recorder it was found that the effect of sand storms was to sand-blast the glass sphere of the recorder to such an extent as to render it quite useless. A similar effect was observed upon some of the thermometers in the Stevenson screen, the tubes and scales of which became "frosted" and indecipherable.

A concrete hut with a vestibule has now been built to house the recording portion of the anemometer, and access to the inner room containing the instrument is obtained through two doors. Great care has been taken to prevent the access of sand above the instrument where the tube of the direction recorder enters the hut. Around the sunshine recorder a metal frustum of a cone, apex upwards and axis vertical, has been

arranged in such a position that the upper edge of the frustum is in the horizontal plane through the centre of the sphere. It is hoped that by this arrangement the blown sand will be deflected over the top of the sphere.

Meteorological Office Publications.

THE Stationery Office having undertaken responsibility for the sale of Meteorological Office publications, the list of these publications forming sections K–M of M.O. Circular 001, has now been superseded by "List M," which is issued by the Stationery Office. Copies may be had on application to *Air Ministry Publications Department*, 10, *Leake Street, S.E.* 1.

Official Publications.

Professional Notes.—No. 23. *A Comparison between the Dry-Bulb-Temperature in the Climatological Screen at Valencia Observatory and that in a Stevenson Screen exposed in an Open Field adjoining.* By L. H. G. Dines, M.A. Price 6*d*. net.

THE recording of the variations of air temperature is one of the first duties of a meteorological observatory, but it is a duty which involves considerable difficulties.

The members of the Meteorological Committee, at that time a Committee of the Royal Society, who were responsible for the equipment of the seven observatories of the Meteorological Office in 1868 were aware of some of these difficulties. In adopting photographic registration of the temperature as indicated by mercury thermometers they naturally installed the apparatus in substantial buildings. To avoid direct sunshine on the thermometer screens they placed them on the north walls of the buildings. More or less searching comparison between the temperatures recorded in these north-wall screens with the readings obtained in Stevenson screens in more open situations have been made from time to time, though direct investigation of the relation between these north-wall temperatures and the temperature of the free air as measured by an aspirated thermometer has not yet been undertaken in this country. It is known, however, that in general the daily range of temperature is considerably less in the north-wall screen than at a like height above ground in the open whilst the mean temperature of the day is about the same in the two positions.

In the present note Mr. Dines has investigated the relation between temperatures recorded in the north-wall screen at

Valencia Observatory, Cahirciveen, and in the Stevenson screen in the adjacent field.

The north-wall screen temperatures are used for Parts II., III., and IV. of the *Meteorological Yearbook*, whilst the Stevenson readings appear in the *Daily* and *Weekly Weather Reports*, so that it is important to know how nearly they are consistent.

Mr. Dines finds that the rules found in other places do not hold good in the special circumstances of Valencia Observatory. On the average his north-wall screen gives the higher readings at all hours of the day in summer, the Stevenson screen the higher readings in winter. Closer analysis of the data showed that the most conspicuous difference, the excess of north-wall temperature above Stevenson temperature at midday in summer, was characteristic of winds, especially light winds, from westerly quarters. As such winds predominate they govern the average values of the temperature difference. No explanation of the curious phenomenon is suggested in the note, but it may be surmised that the air is warmed as it passes the heated walls of the observatory before it reaches the screen. It is hoped that the publication of the note will stimulate further investigation of a problem which is of considerable interest from many points of view.

Professional Notes.—No. 25. *A Minor Line-Squall.* By Captain M. T. Spence. Price 9*d*. net.

The line-squall of August 14th, 1919, discussed in this note, is remarkable as having occurred in an anticyclonic area. The change of wind direction was also unusual, from south-west to north-east.

It is believed that this is the first occasion on which pilot-balloon observations have been available for discussion in connection with a line-squall.

Discussions at the Meteorological Office.

Oct. 17th. *The Law of the Geoidal Slope and some Fallacies in Dynamic Meteorology.* By C. F. Marvin. Monthly Weather Review, October 1920.

The main fallacy attacked in this paper, which was summarised by Sir Napier Shaw, is involved in the wrongful application of the law of equal areas. Authors have assumed that, in the absence of friction, a particle changing its latitude would retain its moment of momentum about the earth's axis, ignoring the fact that the very forces which move the particle from one latitude to another will generally have a component

tending to change this moment of momentum. Ferrel's theory of the general circulation of the atmosphere was based on this assumption, and led him to contemplate wind velocities of thousands of miles per hour. Ferrel attributed the mitigation of these velocities in the actual atmosphere to friction, but Marvin denies its adequacy. He uses the term geoidal surface for a level surface, and enunciates his law of the geoidal slope as follows: "A geoidal surface is a neutral or horizontal surface only for bodies at rest upon it. That is, gravity is powerless to set up any lateral motions among such bodies. The surface slopes towards the equator for every body having a relative motion eastward, and towards the pole for every body with a motion westward. A component of the force of gravity pulls the moving bodies down the slopes." This language does not seem very appropriate because the characteristic of a geoidal surface is that it has no slope; by its very definition it is everywhere horizontal. When a particle is moving on the level surface there is no longer equilibrium between the horizontal components of the centrifugal force and of gravitational attraction, but it is the centrifugal force that is fickle, not gravity. The conclusion of Prof. Marvin's argument is that the only observable effect of the earth's rotation is a deflection of the motion of a particle and not an acceleration, and that the moderate velocities in the actual atmosphere can be accounted for without exaggerating the importance of friction.

Although the points brought out by Prof. Marvin are familiar to most workers on dynamical meteorology, the publication of the paper should call attention to the weak spot in many textbooks and so improve the standard of teaching the subject.

Oct. 31st. *On the correlation between the fluctuations of the sun-spot area and the terrestrial precipitation.* S. Kunitomi and H. Tako. Bull. Cen. Met. Soc., Japan, 3.

The discussion on this paper was opened by Mr. Salter. The paper gives an account of a portion of an investigation on statistical lines on the direct relation between the areas of solar faculae and the rainfall in various parts of Japan, and deals solely with short period variations. A tendency for a 7 day period in the autumn rainfall was shown to have some relationship with the incidence of faculae at the time of their passage across the solar "meridian." Faculae were most numerous between 5° and 10° distant from the solar equator and the correlation with rainfall was shown to be

at a maximum in respect of faculae in these latitudes. The correlation coefficients were, however, too small to be significant considering the short period of the observations.

Discussion turned principally upon the existence of a 7 day periodicity and the opinion was expressed that if any such existed it would more probably be terrestrial in origin.

Correspondence.

To the *Editors*, "*Meteorological Magazine*."

Thermometer Exposure at Kew Observatory, Richmond.

WITH reference to my letter in the August issue of the *Meteorological Magazine* and to your comments thereon, I am astonished to learn that the official records at Kew are taken from the readings of thermometers exposed in a north-wall screen instead of from instruments in a regulation Stevenson screen.

Presumably the instruments at Kew were originally exposed in a wall screen and, therefore, they have continued to be used for the sake of continuity and comparison. Even if that is so, however, there would appear to be no reason why readings in the Stevenson screen should not have been used as the "official" ones since the establishment thereof, thus being in conformity with readings taken at the majority of Meteorological stations. In the same way, instruments at both Greenwich Observatory and Camden Square are also exposed in Stevenson screens, I believe, as well as on Glaisher stands, and I see no reason why the figures obtained from the Stevenson screen should not be quoted in the *Daily Weather Report* instead of the latter ones. This would make them more strictly comparable with readings obtained at the other London stations.

I notice that the difference between the north-wall screen minimum and that in the Stevenson screen at Kew on the night of December 12–13th last was as great as 5°—a very remarkable divergence (incidentally, I see you now quote the minimum at Kew as 20° F. instead of 21° F. as given on page 138 of the Magazine for last June). In spite of the explanation now given with regard to the use of the north-wall screen and which, of course, accounts largely for the divergencies to which I called attention, the reading still seems exceptionally high, in view of the figures recorded at

practically all other stations in the metropolis and the surrounding area, and of the fact that the frost was severe and continuous throughout the day of December 12th and readings below 20° F. were registered in most places quite early in the evening. H. FREIR.

Bylock Hall, Ponders End, August 29th, 1921.

WITH reference to Mr. Freir's letter in the August number about what was apparently a large difference of temperature between Kew and other places in the neighbourhood on the coldest night last year, your note clears up the mystery but also suggests that a student of the official Reports might as well ignore the Kew readings. The use of the Glaisher screen at Camden Square and Greenwich is indicated in these Reports, but not in newspaper accounts of heat or cold, and, in any case, such complications would not be generally understood. Last summer when temperatures of 90° F. or so occurred in Stevenson screens, I heard people remarking that once the temperature rose to 100° F. (at Greenwich in 1911), and naturally they did not appreciate that this reading was the result of a method of exposure which, at least in fine weather, generally shows higher maxima and lower minima than does the ordinary method.

Could not the difficulty be eliminated if those stations, which maintain abnormal methods of exposure for historical reasons, would publish only Stevenson screen readings? (I assume the superiority of the latter method, as even that one is apt to show higher temperatures than are recorded by a thermometer placed in an open but shady position, and the Glaisher method is, consequently, open to greater objection from this point of view.) G. WESTON.

47, Chester Terrace, S.W.1, September 29th, 1921.

A FUNDAMENTAL point, to which I see no reference by Mr. Freir or Mr. Weston, is that Kew Observatory is a first-order station, for which hourly values from a thermograph are deemed essential. The ordinary Stevenson screen is not suitable for the accommodation of the Kew pattern thermograph in use at first-order stations. The north-wall screen referred to in the correspondence is intended primarily for the thermograph, and seems to serve satisfactorily the purpose to which it has been devoted for over 50 years. If we published hourly values from our thermograph, and maxima and minima derived from the Stevenson screen, we should introduce a promiscuity into our results in addition to a discontinuity between the past and the future. Whether

these disadvantages are outweighed by the advantage of publishing data more directly comparable with those at ordinary stations is a matter of opinion.

A third course would be to publish two sets of maxima and minima, taking such precautions as may be possible to prevent confusion.

As to the accuracy of the minimum reading from the north-wall screen on the night of December 12th–13th, 1920, we had as a matter of fact two minimum thermometers in the screen, and their readings differed by only 0°·2 F. We had also two thermographs running, there being a Callendar electrical-resistance recorder as well as the Kew photographic instrument. The two thermographs are not quite as sensitive as the ordinary minimum thermometer, and their readings were higher by a few tenths, both being 21° F. to the nearest 0°·5. The difference between the minima from the two screens was probably due in considerable measure to circumstances other than the differences between the types of screen. Not merely is the north-wall screen at a greater height above the ground than the Stevenson screen, but the ground level is also higher at the position of the former screen. There was fog on the occasion in question, and also snow on the ground, so the variation of temperature with height was probably abnormal.

C. Chree.

October 3rd, 1921.

A Shallow Sea Fog. Spithead, October 23rd, 1921.

During the passage across the water from Ryde to Portsmouth on Sunday evening, October 23rd, I noticed a curious phenomenon which is of somewhat rare occurrence in home waters. The wind was blowing strongly from north-north-east with squalls of cold rain, and the whole surface of the sea, as far as the eye could reach, was covered with a layer of fog moving rapidly from north to south and only about 3 feet thick. I believe this phenomenon is known as the sea "smoking," and is usually observed in Southern waters—in the Levant and also in the Straits of Gibraltar. It is caused, I suppose, by the flow of cold air across sea which is very much warmer than the air itself. At the time of my observing this, 5 p.m., the temperature of the air at Calshot was 40° F., while the sea temperature must have been 60° F. or even above, for the steamship *Arundel* gave in mid-channel a sea temperature of 59° F. and an air temperature of 46° F. at 4.30 a.m. next morning.

J. E. Cowper.

October 1921.

Mirage at Skegness.

THE mirage observed at Skegness on Sunday, July 10th, appeared to be the finest example of this phenomenon remembered at the town.

The weather previously had been consistently bright and dry, with vapour pressures and humidity percentage as follows:—

Date.	Time.	Vapour Pressure.	Relative Humidity.
	S.T.	mb.	%
July 7th - -	18 h.	15·6	85
„ 8th - -	10 h.	13·2	76
„ 8th - -	18 h.	16·9	73
„ 9th - -	10 h.	15·6	73
„ 9th - -	18 h.	15·9	63
„ 10th - -	10 h.	12·6	62
„ 10th - -	18 h.	16·9	65

The wind on the previous days had been in an easterly direction, but early on the morning of the 10th it changed to south-south-west. The sky being clear, the direction of the upper air currents could not be observed. At about midday peculiar cloud effects were noticed on the horizon, giving the appearance of a well-wooded tropical coast line. This became somewhat indistinct until 16 h. 30 m., when a faint darkness appeared on the horizon, increasing in density and in its liquid appearance until objects were noticed in an inverted position at an altitude of about two degrees above the horizon. The phenomenon was apparent from a point north-north-east at sea to a little west of Snettisham tower, across the Wash, in the south. The last-mentioned object could be seen inverted, and looked like a waterspout, being apparently enlarged but not so distinct as the other objects seen. A concealed chalk pit at Hunstanton was also seen reflected, as well as a few sailing boats. The effect passed off soon after 18 h.

The next day was still very hot, but misty, the maximum temperature being 85° F., against 81° F. on the 10th. The mirage, however, was not seen again.

By reason of the drought, all the dykes are dry, and at the end of the month there was no water in the main land drain. Such a thing could not be remembered by old inhabitants.

R. H. JENKINS.

Council Offices, Skegness, August 10th, 1921.

Exceptional Weather in October 1921.

On October 18th, the shade temperature rose to 72° F. under the influences of a nearly cloudless sky and southerly breeze; but the more exceptional incident was the extreme mildness of the night which followed, for the thermometer did not fall below 61° F., though rain began at 8.40 p.m. and lasted some time.

Greenwich records 1841–1905 show no minimum for any date in October above 59°·5, so that the reading for the morning of October 19th this year deserves special notice.

W. F. Denning, F.R.A.S.

Bristol, Oct. 19th, 1921.

The Recent Drought. A Seventh Century Parallel.

Bede in his *Ecclesiastical History* records that at the time when Wilfrid baptized the first converts of Sussex : . . . "no rain had fallen in that province in three years before his arrival, whereupon a dreadful famine ensued, which cruelly destroyed the people. In short, it is reported, that very often, forty or fifty men, being spent with want, would go together to some precipice or to the sea shore, and there, hand in hand, perish by the fall, or be swallowed up by the waves. But on the very day on which the nation received the baptism of faith, there fell a soft but plentiful rain."

No doubt the statement that no rain fell for three years is an exaggeration, but it is interesting to note that a very serious shortage of rainfall occurred about 680 in the same corner of England in which a shortage has been felt this year.

A. E. Swinton, F.R.Met.Soc.

Swinton House, Duns, Berwickshire, Oct. 1921.

NOTES AND QUERIES.

Sequence of Wind Changes at Different Levels in a Depression.

I have often noticed that a change of wind begins at the ground level and spreads upwards, not always, but especially in connection with a depression. This was very marked on October 23rd, when a shallow depression passed to the south from north-west to south-east. At 8 a.m. it was clear and sunny and clouds moving from north-west; the church vane—which is extremely sensitive—pointed the same way. After 10 a.m. the sky became clouded from the west, there was no appreciable

wind but the vane pointed south-west. At 11 a.m. rain started, the clouds moving from west at an altitude of about 2,000 feet. At noon the vane pointed south-east and the clouds had drawn to south-west and were below 1,000 feet. At 1.30 p.m. the vane was east and the clouds, below 1,000 feet, were coming from south; the rain drove from the east in agreement with the vane, there being now a fresh breeze. The rain stopped at 3.30 p.m. with clouds, still at 1,000 feet, coming from east and the vane at north-east and temperature as low as 40°. The sky became clear before 6 p.m. except for a few low clouds coming from north to which direction the vane had pointed for nearly an hour so that vane and clouds were now in agreement. At one time it was curious to see the rain driving in an almost opposite direction to the clouds from which it fell. R. P. DANSEY.

Kentchurch Rectory, Hereford, November 1st, 1921.

[Reference to the *International Daily Weather Report* shows that the sequence of events was occasioned by the passage of a small secondary depression. The 7h. map for October 23rd, 1921, shows Hereford under the influence of the principal depression over Denmark, the secondary being over the north of Ireland. By 13 h. the secondary had reached South Wales and by 13 h. it was over northern France.—ED. M.M.]

Meteor Trails and Upper Air Currents.

IT has long been recognised that the movements of meteor trails can be used as evidence for currents in the upper atmosphere, but the number of observations available for discussion increases but slowly. A useful collection of reports made by Dr. S. Kahlke is published in *Annalen der Hydrographie und Maritimen Meteorologie*, 1921, Heft IX. Dr. Kahlke makes a broad distinction between observations by day and by night. Following Trowbridge (*Physical Review*, 1906, p. 279; 1907, p. 524) he regards the luminous trails seen at night as electrical phenomena to be assigned to the region about the base of the aurora, say from 80 to 100 kilometres above ground, whilst the trails seen by day are probably the actual meteor dust illuminated by sunshine. These daylight trails are, it is supposed, at heights below 80 kilometres.

It is of interest to rearrange the observations collected by Dr. Kahlke so as to show the number in each calendar month. The tabulation brings out the following facts:—

(1) In the daylight-trail layer east winds occur from June to November. For other months the evidence is doubtful.

(2) In the luminous-trail layer the wind is exceedingly variable during the months August to November. For other months there is little evidence.

Directions from which Meteor Trails drifted.

Month.	Daylight Trails.	Luminous Trails.	
	Northern Hemisphere 1741—1916.	Europe 1805—1913.	North America 1865—1901.
January	NW	W	W.
February	—	SE	—
March	S	—	—
April	E/C/W	S	—
May	C	—	WNW.
June	C, C, E, E, C	N	—
July	E, E	N, WNW	—
August	(E, E), NE, E	(W, W), NW, E/W, NW, NE	S, W, NW, NW, (SW, W).
September	E	NW, SSW, W	—
October	—	N, SW, SW/E, S, SSW, (NW, E), SE, E, SW, NNW, E/SW.	NNE.
November	(C, E)	(S, NW, N, WNW, ESE, W, WNW, N, N, W, NW), SE. SW, SW.	(S, S), (S, SE), (NW, NW, NW, NNW, NNW, W, S), (S/N, S, S, N/S, W, S), SW, W, (SW, WSW, SSE, S).
December	E, W	SW	—

Entries enclosed in brackets refer to observations on the same date or consecutive dates; E/SW means E current over SW; C = calm.

The direction from which the air current carrying the trail was blowing is tabulated here; Dr. Kahlke gives the direction to which it was blowing.

Dr. Kahlke makes no suggestion as to further research in this field. It is clear that no detailed knowledge of the variation of upper air currents is to be obtained from casual observations of the few meteors which leave conspicuous trails. The right course is surely that advocated by Prof. R. H. Goddard, of Clark College, Worcester, Mass, the sending up of suitable rockets.

Who will take the initiative in such investigation in this country? F. J. W. W.

The Abnormal Sequence of Warm and Dry Months in London.

OCTOBER 1921 was the warmest month of that name during 64 years' record at Camden Square, and was actually the fourteenth consecutive month with mean shade temperature in excess of the average of 60 years 1860–1919. Four months (marked * in the following table) during this warm spell have given unprecedentedly high mean temperatures. During the greater part of the fourteen months the deficiency of rainfall has been nearly as remarkable as the excess of warmth, the whole period showing a deficiency from the 60 years' average of 12·06 in. September 1920 was wet, and, taking the thirteen subsequent months, the deficiency was 13·18 in. or 45 per cent. July was the only month with an unprecedentedly low fall.

RAINFALL AND MEAN TEMPERATURE AT CAMDEN SQUARE, LONDON, SEPTEMBER 1920 TO OCTOBER 1921.

Mean Temperature is taken as ½ (Mean Max. + Mean Min.) and refers to a Glaisher stand.

Months.	Rainfall.		Mean Temperature.	
	1920-21.	Diff. from Average 1860-1919.	1920-21.	Diff. from Average 1860-1919.
	in.	in.	° F.	° F.
1920.				
September	3·27	+ 1·12	57·9	+ 0·2
October	1·09	− 1·53	51·9	+ 1·7
November	1·12	− 1·21	43·5	+ 0·1
December	2·36	+ ·04	41·0	+ 0·9
1921.				
January	2·48	+ ·43	46·1*	+ 7·4
February	·19	− 1·50	40·7	+ 0·8
March	1·19	− ·67	46·8*	+ 4·6
April	1·29	− ·38	49·5	+ 1·5
May	1·03	− ·82	57·0	+ 2·5
June	·37	− 1·91	61·8	+ 1·6
July	·13*	− 2·26	69·4*	+ 6·0
August	1·65	− 1·73	63–7	+ 1·3
September	2·50	+ ·35	60·5	+ 2·8
October	·63	− 1·99	56·2*	+ 6·0

* Unprecedented since 1858.

The High Tide of November 1st, 1921.

A VERY high tide was experienced along the east coast of the British Isles on November 1st. The Thames at Tilbury Docks rose 2 feet above the normal high-water mark, and in London itself the tramlines on the Victoria Embankment were under water and many wharves in the City were flooded. The Medway, Blackwater, and Colne also overflowed their banks, and in Sheerness Dockyard an increase of 35 inches over normal high-water level was noted. The high water was, no doubt, associated with the wind, which was blowing steadily from the north over the full length and width of the North Sea. Such a wind would produce a flow of water southwards, which would be thrown by geostrophic force on to the east coast of England.

A nice example of the contrast between the northern and southern hemispheres is provided by the remark on p. 312 that floods at Buenos Aires coincided with exceptionally low tide at Montevideo. In that case the wind was blowing the water westwards up the mouth of the La Plata and geostrophic force was throwing it to the left.

Exceptional Visibility.

IN the account, which is sold to visitors to the tower on Leith Hill, it is stated that "the Ordnance Surveyors were able on July 15th, 1844, with the aid of a small glass, to see a staff about 4 inches in diameter on Dunstable Downs." The distance from the tower, which is 64 feet high and stands on the highest ground in Surrey, 965 feet above sea level, to Dunstable Downs is about 47 miles. It would be interesting to have the original authority for the statement which we have quoted.

The Aurora Line in the Spectrum of the Night-sky.

REFERENCE has been made in the May number of this magazine to Lord Rayleigh's photographs of the aurora line in England. A letter in *Nature* of October 13th, 1921, gives an interesting account of his further investigation of the phenomenon.

Lord Rayleigh has found that at Terling, in Essex, the aurora line can be photographed on two nights out of three. Exposures were made on 150 nights, irrespective of weather, and the intensity appears to have little or no connection with magnetic disturbance or with the distribution of sun-spots. It is curious, however, that at Beaufront Castle, in Northumberland, about 3° further north, no trace of the line was found, although exposure on the same kind of plate was made on 26 different single nights. Positive results at Terling

alternated with negative results at Beaufront, so that the latter cannot be attributed to seasonal variation. On two occasions at Beaufront a plate was exposed for five nights, and on each plate the line was observed.

Lord Rayleigh expresses great surprise at the diminished intensity of the line towards the north, and he hopes to pursue his investigations as opportunity occurs.

Templates for Use in Estimating the Duration of Rainfall.

THE convention adopted by the Meteorological Office in estimating the duration of rainfall is that only such rain is to count as falls at a rate of 0·1 mm. per hour or more. To judge when the critical rate is reached a glass or celluloid plate ruled with oblique lines is placed over the record; if the trace is steeper than these lines, then the rainfall is heavy enough to count.

Celluloid templates of two patterns, suitable for use with the Halliwell Gauge and with the Hyetograph respectively, can now be obtained from Messrs Negretti and Zambra and Messrs. Casella & Co. are able to supply similar templates for their self-recording gauges. It is hoped that observers who are interested in measuring the duration of rainfall will appreciate the advantage of the standardized system and will provide themselves with the scales appropriate to their gauges.

British Association for the Advancement of Science.

IT IS announced that the British Association Research Committee for the Investigation of the Upper Atmosphere for 1921–22 is constituted as follows:—Sir Napier Shaw (*Chairman*), Capt. C. J. P. Cave (*Secretary*), Prof. S. Chapman, Mr. J S. Dines, Mr. W. H. Dines, Sir R. T. Glazebrook, Col. E. Gold, Dr. H. Jeffreys, Sir J. Larmor, Mr. R. G. K. Lempfert, Prof. F. A. Lindemann, Dr. W. Makower, Sir J. E. Petavel, Sir A. Schuster, Dr. G. C. Simpson, Prof. H. H. Turner and Mr. F. J. W. Whipple.

Meteorological Stations.

Lisburn.—Mr. John Ridges, of the Friends School, Prospect Hill, who has been responsible for the observations at Lisburn since 1911, has now resigned his headmastership. Mr. Ridges has been succeeded by Mr. J. Woolman.

The Artificial Production of Rain.

A RECENT article in *The Times* gave an account of the work of Mr. Charles M. Hatfield, who claims to have produced eight inches of rain in three months at Medicine Hat, Alberta. His method is not described in detail, but Mr. Hatfield states that he uses a tank filled with certain unspecified chemicals exposed to the air about 25 feet above the ground, and some 22 miles from Medicine Hat. It is said that this apparatus draws clouds from other parts to Medicine Hat and causes them to precipitate their moisture there.

This article was followed by correspondence. Mr. Carle Salter laid stress on the thermodynamical aspect of the problem, and Captain C. J. P. Cave complained of the vagueness of Mr. Hatfield's "explanations." The conclusion of Captain Cave's letter may be quoted. "The medicine man in Central Africa was, no doubt, busy last night (*i.e.*, Oct. 16th) in warding off the baleful influence that was affecting the moon. He was wonderfully successful, he succeeded in preventing the total obscurity of the moon's disc, and by the end of his endeavours, the moon shone again with its usual brilliancy. I actually witnessed his success, so I know what I am talking about."

Dr. H. Jeffreys compared two of the rain-maker's records with official statistics, with the following result :—

Place.	Date.	Rainfall.		
		From *The Times* Article		From Official Records.
		Guaranteed.	Supplied.	
Los Angeles -	Jan.-Apl. 1905-	18 ins.	29·49 ins.	14·98 ins.
Medicine Hat -	May-Aug. -	8 ins.	8 ins.	4· 8 ins.

A further letter from Mr. J. T. Lithgow, of Yukon, is also of interest. It appears that, in 1904, Mr. Hatfied was offered by the local Council a large sum of money to produce good rainfall in the Klondyke district during June, July and August.

In this case, though he tried for six weeks, the rain-maker was not successful, as he himself admitted.

Erratum.—In the note on Unprecedented Drought on p. 264 of the October number the driest periods previously recorded at Chitterne were erroneously given as having occurred in 1858–59. This should read 1857–58 in both cases.

The Argentine Daily Weather Reports.

From October 1st, 1921, the isobars on the Daily Weather Charts of the Argentine Meteorological Service have been drawn at larger intervals than hitherto. Formerly they were shown for every 2·5 millimetres of mercury; now they are shown for every 3 millimetres. The change brings the Argentine maps into line with the international section of our own Daily Weather Report, since 3 millimetres are equivalent to 4 millibars. Comparison is facilitated by each isobar bearing a pair of equivalent denominations, *e.g.*, 1,020 mbs. and 765 mm.

The Argentine Meteorological Service is to be congratulated on the wide scope of its report, which covers the whole of South America. Provision is made for daily reports of rainfall for about a thousand stations in the Argentine.

A Meteorological Observatory at Breslau.

After long negotiations with the Entente a few aircraft have been given over to the Krietern Meteorological Observatory, near Breslau, for the purpose of upper-air soundings. According to the *Illustrierte Flugwoche*, September 28th, 1921, the observatory is to undertake researches on the cyclones which follow the track denoted by Von Bebbe as 5 b, since cyclones are said to have become disastrous for Upper Silesia, and to have produced severe floods in the Oder.

The "C.G.S." System.

A correspondent calls attention to an order issued at Baghdad at the end of 1918 and including the following recommendations:—

> *Adoptions of Continental Units Advocated.*
>
> Under peace conditions Meteorological Work will be much more in co-operation with Egypt, Turkey and Caucasia than with India, so that the adoption of Continental units is practically essential. Indeed, if Egypt has adopted, or is likely to adopt, the "Chief of the General Staff" system of units with the millibar as the unit of pressure, it would be advisable to go one better than the Continental system and adopt the "Chief of the General Staff" system straight away from the beginning.
>
> *Instruments.*
>
> Instruments graduated for Continental or "Chief of the General Staff" units can be obtained in England.

Readers who are occasionally baffled by the use of unexplained initials in military intelligence will sympathise.

Reviews.

The Rainfall of the British Isles. By M. de Carle S. Salter. 8vo. xiii + 295. London University Press, 1921. Price 8s. 6*d*. net.

THIS volume is such a book as only Dr. Mill or Mr. Salter could have written. It has been long wanted by water-engineers and the general public as well as by meteorologists, and it is extremely satisfactory that the accumulated experience of 62, Camden Square, should at last have been made available in an easily accessible form.

There is perhaps not very much that is new but there is a very great deal that even those interested in the subject do not know. Naturally the volumes of *British Rainfall* have been drawn on, and it is not too much to say that practically everything of importance that has appeared in that long series receives somewhere or other appropriate mention. But that does not imply that in any sense the book is "cauld kail het." It is a serious and coherent presentment of the subject. The purpose of the book is stated in the introduction; it is "to bring together some of the general conclusions so far deduced; to suggest, rather than formulate, a working hypothesis which future students of the subject may build upon or amend, and to draw attention to the economic utility of a more complete knowledge of our resources in respect of one of Nature's greatest gifts." Six chapters are taken up with discussions of methods of obtaining data, and deal with rain gauges and their exposure together with methods of mapping. The remaining eight chapters are occupied with the discussions of results obtained especially with reference to the incidence and frequency of daily rainfall, types of seasonal distribution, the seasonal variation and the fluctuation of annual rainfall and the relation of rainfall to configuration. The book concludes with a chapter on the economic application of rainfall data in which, among other things, we are given a most interesting account of the method of construction of rainfall maps of small areas.

Perhaps the most striking general impression received in reading the chapters dealing with the results and still more after looking at the maps is how wide are the differences in the distribution of rainfall according to whether the time considered is 35 years, 35 months of the same name, a single year, a single month or a single day. Mr. Salter groups rainfall into three types, convectional, cyclonic, and orographical. The maps for the longer periods, 12 months and over, show the orographical effect more or less strongly. The maps for months sometimes show the effect and sometimes

do not. Maps showing the amount of rain measured on particular days show the effect only occasionally. When it comes to plotting the areas over which rain is falling at a named hour Mr. Salter can produce maps showing convectional rain and maps showing cyclonic rain, but not one showing even slightly the orographical effect. This may of course result from the fact that orographical rain is not such a striking phenomenon as convectional or cyclonic rain may be, and simply has not been studied, but one rather begins to wonder how often purely orographical rain really does fall. Mr. Salter is careful to warn us that the three types "merge imperceptibly into one another and more often occur in conjunction than not" but from what has been said it is not at all obvious that even that is the whole story.

The curious thing is that when larger areas as well as shorter times are considered the orographical effect again becomes less noticeable. For example, in the monthly maps of rainfall over the continent of Africa one is scarcely conscious at all of any effect of relief. Perhaps this is partly due to the lack of data. The fact that in no country in the world has rainfall been studied in such detail that the effect of relief is known with such accuracy as in Britain encourages the belief that even more detailed results may be forthcoming. There is certainly no one who knows more about the subject than Mr. Salter and he has summarised what is known lucidly and effectively.

J. FAIRGRIEVE.

Record of Bare Facts for the year 1920 (Thirtieth report of the Caradoc and Severn Valley Field Club). The section on Meteorology contains rainfall tables, monthly summaries of weather, a table of extremes for the year, and notes on farm and garden crops. In all the tables the stations are arranged according to heights, and as the heights of the thirty-seven stations vary from 140 feet to 1,400 feet, the contrast between hill and valley climatology is well brought out. The tables should be used with caution, however, as internal evidence suggests that in some cases the returns from individual stations have been utilised without adequate scrutiny.

Obituary.

Julius von Hann.—It is probably the lot of everyone to have had during life a regard for some person which amounts almost to personal and intimate friendship, although one may never have seen or even corresponded with the object of that regard. Sometimes it is an author, sometimes a character in a book and sometimes a historical personage, but in every

case the feeling is very real and vivid. The scientist experiences this feeling quite as strongly as those of a more literary turn of mind, and to many of us Faraday, Maxwell, Kelvin are not mere names met with in text-books, but real live men worthy of honour and devotion.

To many meteorologists, certainly to all who can read German, Hann appealed in this way. One knew from his writings, seldom controversial, never militant, that he must be of a quiet retiring nature, a conclusion confirmed by all those who have had the pleasure of his acquaintance. One likes to picture him in his room in the Hohe Warte in Vienna searching, always searching, in likely, and more often in unlikely, places for any reference to weather conditions, which could add to our knowledge of the atmosphere and its ways.

And when Hann had once found a piece of weather information it could never again be lost to the world. Within a month or two of its discovery it was made known to all those whom it might concern in the pages of the *Meteorologische Zeitschrift*, but that was not all, for Hann's encyclopædic mind was able to see its relationship to other factors and like a piece in a puzzle it was fitted into its place to make possible those masterly descriptions of climate found in his *Klimatologie* and those clear accounts of atmospheric processes which make up his *Meteorologie*.

Hann started life as a school teacher, but at the age of twenty-nine his natural love of meteorology led him to enter the Central-Anstalt für Meteorologie in Vienna; six years later, in 1874, he became Director and held that office until 1897, when at the age of fifty-eight he retired. His retirement was only from official duties; from meteorology he could not retire, and did not retire, until the very presence of death made further work impossible. The first fruits of his relief from official duties was his *Lehrbuch der Meteorologie*, which was written between the autumn of 1898 and August 1900 in the Physicalische Institut in Graz. This book, which was so different from any previous text-book of meteorology, became at once the recognised standard book of reference and from 1900 onwards practically no major piece of meteorological work has been published which does not draw upon the Lehrbuch for facts and data.

Hann's *Handbuch der Klimatologie*, which had been written while he was still Director of the Central-Anstalt, is probably better known to British meteorologists than the Lehrbuch, for the only reason that it has been published in an English translation. It is surprising how readable Hann has made this book, dealing, as it does, with little more than a mass of climatological statistics collected from all parts of the world.

But that is one of the great charms of Hann's writing that he is able to present the driest of meteorological facts in a pleasing and enticing manner. In the *Klimatologie* this end has been reached by leaving in so much of the original work from which the information has been extracted. It helps even a meteorologist to enjoy the account of the climate of a place if he knows that the data were provided by a Livingstone, a Franklin or a Scott.

The *Klimatologie* and the *Meteorologie* are Hann's largest individual works, but it is questionable whether the writing of these books is his most valuable contribution to meteorology. Probably science owes more to him for the mass of information he has rescued from oblivion and preserved in the *Meteorologische Zeitschrift*, of which he was the editor, or joint-editor, from 1866 to 1920, the *Zeitschrift* in the meantime undergoing several changes both in name and control.

Hann has received many honours, national and international; probably of all of these, those which he most appreciated were the issue in 1906 of a special volume of the *Zeitschrift* called the *Hann Band* to celebrate his forty years of editorship, and the spontaneous exhibition of esteem which he received on his eightieth birthday from all parts of the world in spite of the disastrous effects of the war on international relationships.

Hann was born on March 23rd, 1893, and died on October 1st, 1921—a long life, a full life, and a life for which every meteorologist has cause to be grateful. G. C. S.

William Speirs Bruce, LL.D., August 1st, 1867-*October 29th,* 1921.—As a student in Edinburgh 35 years ago W. S. Bruce made many friends by his pleasant disposition and his whole-hearted enthusiasm in the study of natural history. Hence, when surgeons of scientific tastes were required for the four Dundee whalers which proceeded to the Antarctic regions in 1892, he was appointed to the *Balaena* for his scientific rather than his medical qualifications. The voyage drove him far from a medical career, and he returned with meteorology and oceanography added to marine zoology as his chief interests. Opportunities were few at the time in any of these departments, but Bruce was ready to seize all that turned up. Like many Edinburgh students of his time, he had occasionally lent a hand in the Ben Nevis Observatory, where observations of all the instruments were made hourly by day and night, and on two occasions he had been in charge of the observatory in the absence of Mr. R. T. Omond. It was while he was on Ben Nevis in 1896 that I telegraphed to him on

June 5th on behalf of the Jackson-Harmsworth polar expedition offering him a position as naturalist, and on June 9th he left the Thames in the *Windward* for Franz-Josef Land. Never surely were the preparations for an Arctic voyage carried out so promptly.

The year in the Arctic made Bruce a polar explorer, and he seized chance after chance on private expeditions to Novaya Zemlya and Spitsbergen to equip himself for his life-work. He owed much to the encouragement and help of the Prince of Monaco, both afloat in his yachts and ashore at the Monaco laboratories. Bruce yearned after the Antarctic regions and nearly accepted a post on the *Discovery* under Captain Scott, but fortune favoured him with a wealthy supporter in Major Andrew Coats and he was able to fit out an expedition of his own on board the *Scotia*. He left the Clyde in November 1902 with the best equipment for meteorology and oceanography that had yet been provided for any polar ship and with the aid of Mr. R. C. Mossman who was in charge of the meteorological work the expedition to the Weddell Sea was epoch-making. The captain of the *Scotia* was Thomas Robertson of Dundee, one of the ablest ice navigators who ever left that port, but Bruce and his scientific colleagues were in full command of the expedition. The *Scotia* returned in 1904 and from that time onward, apart from some summer visits to Spitsbergen, the main occupation of Bruce's life was the working-up of his collections, and the publication of the results. For this purpose he founded the Scottish Oceanographical Laboratory in Edinburgh and dispite almost crushing financial difficulties he produced a splendid series of volumes.

He was for many years Lecturer on Geography in the Heriot-Watt College, Edinburgh, and he did much to assist the later Antarctic explorers and to advise Government Departments concerned with the southern whale and seal industry.

Bruce received the gold medals of the Royal Geographical Society and of other geographical societies in various countries as well as the Keith Prize of the Royal Society of Edinburgh and he was created LL.D. by the University of Aberdeen. But although recognition and that of a kind which he keenly valued was not lacking he had a tremendous struggle with difficulties which his ardent independence of all external authorities did not tend to diminish. He was never robust and his enthusiastic energy wore him out before his work was finished. He has raised his name to a high position amongst naturalists and explorers and leaves many friends to mourn his loss. HUGH ROBERT MILL.

News in Brief.

The 1921–22 session of the Royal Meteorological Society was opened on November 2nd, by a *soirée* held at the new premises, 49, Cromwell Road, S.W. 7.

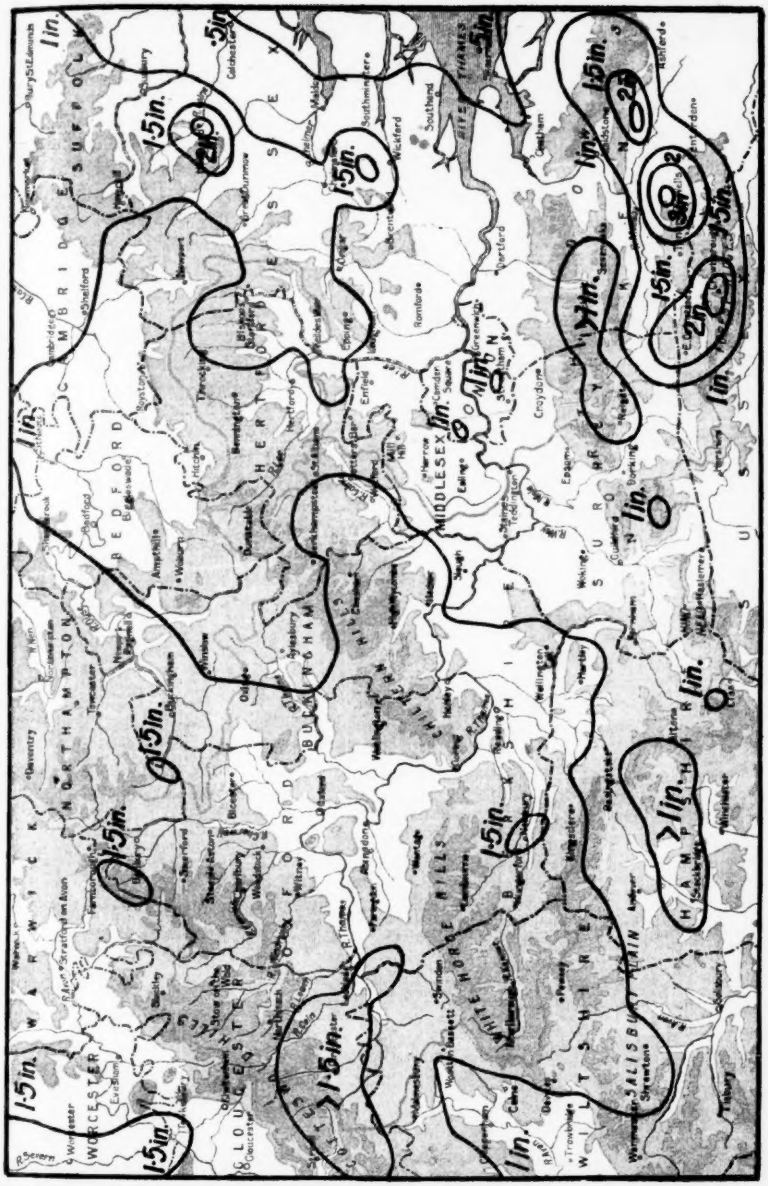
The meeting of the Physical Society on Friday, November 25th, will be devoted to a discussion on Hygrometry. Meteorologists are invited to attend. The meeting will be held at the Imperial College of Science, South Kensington, at 5.0 p.m. An exhibition of hygrometrical apparatus will be open from 3.0 p.m.

The Weather of October, 1921.

During the first three weeks of the month pressure was highest over Central and Southern Europe, settled conditions extending over our south-eastern districts, where exceptionally warm weather was experienced. By contrast the weather was very unsettled in the north-west and in Northern Europe. Relatively low pressure between Spain and the Azores was associated with rain almost daily during this period. A change of type occurred on the 22nd, highest pressure becoming established off our south-west coasts. Conditions now became very unsettled in the Mediterranean, and occasional secondaries from northern depressions penetrated Central Europe.

The month opened with a belt of low pressure extending from the Azores along our north-west coasts to Scandinavia. Snow fell in the north of Norway and in Iceland, in a polar current from north-east, but generally cold conditions were limited to these northern regions. On the 2nd a shallow depression moved in from the Atlantic, bringing to the south of England a temporary influx of air from the south-west, interrupting the southerly current which characterised the early weeks of the month. The transition was marked by thunderstorms on both sides of the Channel. Early on the 3rd this depression, growing deeper, passed across Scotland to Scandinavia, where northerly gales and sleet occurred, and an anticyclone moved south-east from Iceland, reaching the Shetlands on the morning of the 4th. Pressure remained low over the Atlantic, and a southerly current was re-established over France and the British Isles. A notable phenomenon which developed out of this distribution was a line of convergence of winds extending from west to east across the Midlands, fed on the south by warm air from France and on the north by cold air from Scandinavia, circulating round the Shetlands anticyclone. This system remained stationary for about 12 hours, producing considerable rainfall on its northern side, 44 mm. being reported at Cranwell, 25 mm. at Notting-

THAMES VALLEY RAINFALL, OCTOBER, 1927.



Isohyetals.

*watershed of River Thames above Teddington and River Lea above Feildes Weir.

ALTITUDE SCALE: Below 250 feet | 250 to 500 feet | 500 to 1000 feet | Above 1000 feet

SCALE OF MILES: 0 5 10 15 20

H.M. Stationery Office Press, Kingsway W.C.2.

Ps 3337/948. Wt 20. D.P.R.S. 1250 11/27

ham, and 14 mm. at Manchester. The southerly current was drawn, apparently, direct from Africa, and remarkable temperatures were experienced on this and succeeding days in England and France. Biarritz recorded 93° F. on the 4th, while 83° F. was reached at Kew Observatory on the 5th, and at Croydon on the 6th. Minima, too, were abnormally high, Kew registering 62° F. on the night of the 3rd–4th, which is a record for the time of the year. The exceptionally high upper air temperature, exceeding 60° F. at 5,000 feet on the 5th and 6th, favoured high surface maxima.

On the 4th the Atlantic depression commenced to move slowly northwards, and with it the rain-line over the Midlands, which could be identified with the outer extremity of the "steering-line." This rain-line marked the renewed northward progress of mild conditions, and passed across the Arctic Circle on the 6th. During the night of the 5th–6th thunderstorms occurred in the west and north of the British Isles, associated like those of the 2nd, with the replacement of a warm southerly current by a cooler one of more westerly origin, though the veer of wind was only small. At Baldonnel, where a storm occurred, temperature fell in the night about 8° F. at heights up to 5,000 feet and less above.

The morning of the 10th saw a depression centred over Ireland, bringing strong northerly winds in its rear and heavy rain in places in the west and south-west. Some rain fell in the south-east of England, and thunder was reported locally, but the depression filled up without making further progress.

On the 14th the centre of highest pressure was temporarily transferred from Central Europe to the south-west of the British Isles during the passage of a deep depression far north, which caused widespread high winds and gales over the north of Scotland, Scandinavia, and Denmark. Cooler air passing round the anticyclone invaded the south-east of England, resulting in local ground frosts on the mornings of the 15th and the next few days.

A small secondary to a northern depression passed up the English Channel on the 20th, and thunder was again reported locally in the south. A very local rainstorm of great violence, but unaccompanied by thunder or lightning, broke over Shanklin, Isle of Wight, between 6 h. 45 m. and 9 h., and yielded 33 mm. of rain. Low-lying streets were flooded and considerable damage done to roads.

A complete change of type occurred on the 22nd, when a depression passing across this country to Denmark brought the first marked influx of polar air, definitely terminating the exceptionally warm weather of the first three weeks. Penetrating to the south of France, this cold current was

felt as the Mistral on the Mediterranean coast, being associated, characteristically, with the formation of a depression south of the Alps. Subsequently, strong winds and heavy falls of rain occurred in the Mediterranean area. On the 24th, 80 mm. was recorded at Sanguinaire and 61 mm. at Rome. The depression, approaching Denmark, developed rapidly, and northerly gales occurred in the North Sea and Baltic in its rear. High pressure, established off the south-west of the British Isles by the 24th, dominated the situation in the southern districts during the remainder of the month, but high winds and gales were frequent in the north of Scotland, as in Northern Europe.

On the London-Continental aerial routes morning mist and fog were prevalent but day visibility was mostly fair or good. Very low cloud was rare. On the other hand there were many days with little or no low cloud at all. Winds at 2,000 feet were mostly under 25 miles per hour. Of 76 observations at Lympne 20 showed speeds at this level under 10 miles per hour, 44 between 10 and 25, 10 between 25 and 45, while on two occasions this was exceeded, on the 3rd and 24th, when 48 miles per hour was registered. M. A. G.

In Western Europe October was characterised by abnormal warmth and dryness, punctuated by occasional heavy falls of rain. In Belgium the drought again became serious, and it was necessary to close factories and limit the consumption of water for domestic purposes. In Beauvais a third crop of hay was cut for the only time within living memory, and near Geneva many fig trees yielded a second crop of fine quality. In the Alps the melting of the glaciers owing to the warm weather caused local floods and high water levels in the lakes. On the 10th, however, there was a severe thunderstorm in the Hérault (Gulf of Lyons), accompanied by heavy rain, causing floods, which did some damage. On the 23rd and 24th, with a deep depression in the southern Baltic, cold stormy weather was experienced, accompanied by blizzards in northern Jutland and southern Sweden and heavy snow in the Alps. Gales on the 24th caused damage to shipping in Holland and Denmark. Between the 24th and 29th a depression in the neighbourhood of Italy caused cold weather, with a severe gale at Florence on the 24th and heavy rain near Naples and over Vesuvius on the 25th and 27th.

In India the month opened with a vigorous monsoon in the Peninsula and rainfall above normal in most places. Early harvest had begun, and the condition of the crops was good generally, except in Baluchistan, where the prospects were very poor. There was some distress in Madras, but good

rains had fallen in the affected tracts. A telegram dated October 19th reported good rains generally, and favourable conditions for sowing in all the principal wheat regions. In the Bombay Presidency, after a monsoon period of extreme doubt and anxiety, conditions improved, and the season was on the whole an average one, satisfactory in the north but poor in the south. Cotton crops were good on the whole. A telegram to the Marine Division on October 24th reports one storm in the Bay of Bengal and a weak monsoon over the Peninsula; the last advices, dated the 26th, show fair or scanty rainfall in most places and a weak monsoon.

In North America the month opened with a severe storm in Ontario and Quebec, in which trees were blown down, houses unroofed, and much damage done to electric and telephone services and to orchards. Depressions caused fairly heavy rains in the Great Lakes and St. Lawrence region on the 8th to 12th, and again on the 18th to 21st, but conditions were generally anticyclonic until near the close of the month. On the 26th, however, a violent cyclone visited Florida, causing damage to the extent of several million dollars. Tampa was the chief sufferer, owing to a hurricane wave which swept over the lower parts of the town, wrecking nearly 500 houses, and killing five people. The orange crops in the path of the storm were damaged. Two days later Britannia Beach, a mining town in British Columbia, 25 miles north of Vancouver, was overwhelmed by a flood due to the mountain stream, swollen by two days' steady rain, being temporarily blocked by an avalanche; when the dam gave way under the increasing pressure, a wall of water 70 feet high descended on the town, carrying away 50 houses, some of which were swept into the sea. There were also floods at Port Coquitlam on the Fraser River, east of Vancouver, which injured the Canadian Pacific Railway bridges and did other damage.

On the night of October 3–4 the Argentine was visited by the worst storm experienced for many years. A deep depression, moving eastward, and centred over Entre Rios at 8 h. on the 4th, brought heavy rains over a great part of the country, which caused the rivers to rise alarmingly. At the same time a terrific thunderstorm broke over the province of Buenos Aires. The fall up to 8 h. on the 4th exceeded 75 mm. at many stations and reached 100 mm. at Cerrito. Rain continued with slight intervals during the rest of the day, while the swollen rivers were banked up by easterly or south-easterly gales. By the morning of the 4th a large part of Buenos Aires was flooded, and violent gusts, increasing in fury as the day passed, tore through the streets,

(*Continued on* p. 312.)

Rainfall Table for October 1921.

STATION.	COUNTY.	Aver. 1881—1915. in.	1921. in.	1921. mm.	Per cent. of Av.	Max. in 24 hrs. in.	Max. in 24 hrs. Date.	No. of Rain Days.
Camden Square	*London*	2·63	·63	16	24	·21	22	8
Tenterden (View Tower)	*Kent*	3·49	·40	10	11	·19	22	6
Arundel (Patching Farm)	*Sussex*	3·96	1·37	35	35	·87	20	6
Fordingbridge (Oaklands)	*Hampshire*	4·15	·86	22	21	·26	18	18
Oxford (Magdalen College)	*Oxfordshire*	2·79	1·18	30	42	·42	18	10
Wellingborough (Swanspool)	*Northampton*	2·52	1·58	40	63	·42	3	8
Hawkedon Rectory	*Suffolk*	2·70	1·30	33	48	·51	10	8
Norwich (Eaton)	*Norfolk*	3·12	1·50	38	48	·54	3	13
Launceston (Polapit Tamar)	*Devon*	4·80	1·56	40	32	·40	23	13
Sidmouth (Sidmount)	,,	3·72	1·17	30	31	·27	20	12
Ross (County Observatory)	*Herefordshire*	3·28	1·32	34	40	·30	19	9
Church Stretton (Wolstaston)	*Shropshire*	3·62	1·91	49	53	·65	3	9
Boston (Black Sluice)	*Lincoln*	2·74	2·07	53	76	1·28	3	8
Worksop (Hodsock Priory)	*Nottingham*	2·63	2·37	60	90	·83	11	11
Mickleover Manor	*Derbyshire*	2·69	3·10	79	115	1·24	3	11
Southport (Hesketh Park)	*Lancashire*	3·54	2·87	73	81	·52	22	16
Harrogate (Harlow Moor Ob.)	*York, W. R.*	3·35	1·72	44	51	·46	12	12
Hull (Pearson Park)	,, *E. R.*	2·98	1·22	31	41	·50	22	9
Newcastle (Town Moor)	*North'land*	3·20	2·17	55	68	·94	22	11
Borrowdale (Seathwaite)	*Cumberland*	12·00	6·75	171	56	..	..	..
Cardiff (Ely Pumping Stn.)	*Glamorgan*	4·80	2·05	52	43	·53	23	14
Haverfordwest (Gram. Sch.)	*Pembroke*	5·41	2·25	57	42	·78	3	10
Aberystwyth (Gogerddan)	*Cardigan*	5·28	3·20	81	61	1·19	3	7
Llandudno	*Carnarvon*	3·59	2·49	63	69	·57	3	12
Dumfries (Cargen)	*Kirkcudbrt.*	4·36	3·35	85	77	·89	21	17
Marchmont House	*Berwick*	3·82	3·04	77	80	1·22	23	13
Girvan (Pinmore)	*Ayr*	5·00	5·01	127	100	1·21	21	25
Glasgow (Queen's Park)	*Renfrew*	3·25	4·92	125	151	1·05	1	21
Islay (Eallabus)	*Argyll*	4·77	5·24	133	110	·91	21	26
Mull (Quinish)	,,	5·60	5·51	140	98	·84	17	24
Loch Dhu	*Perth*	7·15	7·90	201	110	1·35	17	26
Dundee (Eastern Necropolis)	*Forfar*	2·66	2·42	61	91	·35	2	19
Braemar (Bank)	*Aberdeen*	3·75	2·10	53	56	·29	31	20
Aberdeen (Cranford)	,,	3·25	1·62	41	50	·24	1	16
Gordon Castle	*Moray*	3·16	2·44	62	77	·42	2	21
Fort William (Atholl Bank)	*Inverness*	7·03	10·78	274	153	1·45	31	27
Alness (Ardross Castle)	*Ross*	3·85	2·90	74	75	·71	20	26
Loch Torridon (Bendamph)	,,	8·02	10·38	264	129	1·55	17	27
Stornoway	,,	5·18	4·78	121	92	·58	9	27
Loch More (Achfary)	*Sutherland*	7·80	11·23	285	144	1·17	18,28	28
Wick	*Caithness*	2·96	2·32	59	78	·28	20	24
Glanmire (Lota Lodge)	*Cork*	4·15	3·08	78	74	1·11	1	14
Killarney (District Asylum)	*Kerry*	5·37	3·79	96	71	·72	9	19
Waterford (Brook Lodge)	*Waterford*	3·91	3·41	87	87	1·06	18	14
Nenagh (Castle Lough)	*Tipperary*	3·39	2·07	53	61	·37	1	20
Ennistymon House	*Clare*	4·40	5·39	137	123	1·61	9	21
Gorey (Courtown House)	*Wexford*	3·54	3·67	93	104	1·17	3	16
Abbey Leix (Blandsfort)	*Queen's Co.*	3·52	2·35	60	67	·43	22	18
Dublin (FitzWilliam Square)	*Dublin*	2·68	1·95	49	73	·43	22	17
Mullingar (Belvedere)	*Westmeath*	3·12	2·31	59	74	·35	1, 3	20
Woodlawn	*Galway*	3·72	2·97	75	80	·55	22	22
Crossmolina (Enniscoe)	*Mayo*	5·18	7·68	195	148	2·17	9	26
Collooney (Markree Obsy.)	*Sligo*	4·06	3·54	90	87	·86	21	25
Seaforde	*Down*	3·56	3·34	85	94	1·04	21	16
Ballymena (Harryville)	*Antrim*	3·69	3·49	89	95	1·18	21	21
Omagh (Edenfel)	*Tyrone*	3·67	4·35	111	119	1·20	21	23

Supplementary Rainfall, October 1921.

Div.	STATION.	RAIN. in.	RAIN. mm.	Div.	STATION.	RAIN. in.	RAIN. mm.
II.	Ramsgate	·97	25	XII.	Langholm, Drove Rd.	4·14	105
"	Sevenoaks, Speldhurst	1·41	36	XIII.	Ettrick Manse	4·65	118
"	Hailsham Vicarage	·89	23	"	North Berwick Res.	3·43	87
"	Totland Bay, Aston	1·11	28	"	Edinburgh, Royal Ob.	3·80	97
"	Ashley, Old Manor Ho.	·98	25	XIV.	Biggar	3·13	79
"	Grayshott	·83	21	"	Leadhills	4·38	111
"	Ufton Nervet	1·13	29	"	Maybole, Knockdon	4·03	102
III.	Harrow Weald, Hill Ho.	·82	21	XV.	Dougarie Lodge	5·25	133
"	Pitsford, Sedgebrook	1·02	26	"	Inveraray Castle	11·83	301
"	Chatteris, The Priory	1·75	44	"	Holy Loch, Ardnadam	7·62	193
IV.	Elsenham, Gaunts End	·91	23	"	Tiree, Cornaigmore	4·43	113
"	Lexden, Hill House	·63	16	XVI.	Loch Venachar	6·10	155
"	Aylsham, Rippon Hall	1·87	47	"	Glenquey Reservoir	6·00	152
"	Swaffham	1·65	42	"	Loch Rannoch, Dall	3·17	81
V.	Devizes, Highclere	1·11	28	"	Blair Atholl	2·38	61
"	Weymouth	1·14	29	"	Coupar Angus	2·43	62
"	Ashburton, Druid Ho.	2·01	51	"	Montrose Asylum	1·43	36
"	Cullompton	·81	21	XVII.	LogieColdstone,Loanh'd	1·23	31
"	Hartland Abbey	1·83	47	"	Fyvie Castle	1·30	33
"	St. Austell, Trevarna	1·38	35	"	Grantown-on-Spey	2·18	55
"	Crewkerne(MerefieldHo)	1·22	31	XVIII.	Cluny Castle	4·11	104
"	Cutcombe,Wheddon Cr.	2·89	73	"	Loch Quoich, Loan	21·50	546
VI.	Clifton, Stoke Bishop	1·82	46	"	Fortrose	1·49	38
"	Ledbury, Underdown	1·32	33	"	Faire-na Squir	8·06	205
"	Shifnal,HattonGrange	2·01	51	"	Skye, Dunvegan	6·52	166
"	Ashbourne, Mayfield	2·95	75	"	Glencarron Lodge	10·99	279
"	Barnt Green, Upwood	1·61	41	"	Dunrobin Castle	2·50	64
"	Blockley, Upton Wold	1·47	37	XIX.	Tongue Manse	3·97	101
VII.	Grantham, Saltersford	1·43	36	"	Melvich Schoolhouse	3·92	100
"	Louth, Westgate	1·28	33	XX.	Dunmanway Rectory	5·10	129
"	Mansfield, West Bank	4·67	119	"	Mitchelstown Castle	2·69	68
VIII.	Nantwich, Dorfold Hall	2·80	71	"	Gearahameen	5·60	142
"	Bolton, Queen's Park	3·15	80	"	Darrynane Abbey	4·69	119
"	Lancaster, Strathspey	2·66	68	"	Clonmel, Bruce Villa	2·39	61
IX.	Rotherham, Moorgate	1·47	37	"	Cashel, Ballinamona	2·82	72
"	Bradford, Lister Park	1·98	50	"	Roscrea, Timoney Pk	2·06	52
"	West Witton	1·88	48	"	Foynes	2·89	73
"	Scarborough, Scalby	2·60	66	"	Broadford. Hurdlesto'n	2·93	74
"	Middlesbro', Albert Pk.	1·51	38	XXI.	Kilkenny Castle	2·40	61
"	Mickleton	2·50	63	"	Rathnew, Clonmannon	3·28	83
X.	Bellingham	2·43	62	"	Hacketstown Rectory	3·08	78
"	Ilderton, Lilburn	2·69	68	"	Balbriggan, Ardgillan	2·54	65
"	Orton	2·43	62	"	Drogheda	2·16	55
XI.	Llanfrechfa Grange	..	..	"	Athlone, Twyford	3·25	83
"	Treherbert,Tyn-y-waun	4·26	108	XXII.	Castle Forbes Gdns.	2·66	68
"	Carmarthen Friary	3·36	85	"	Ballynahinch Castle	7·36	187
"	Llanwrda, Dolaucothy	3·01	77	"	Galway Grammar Sch.	4·76	121
"	Lampeter, Falcondale	2·99	76	XXIII.	Westport House	4·83	123
"	Cray Station	3·60	91	"	Enniskillen, Portora	4·10	104
"	B'ham W.W.,Tyrmyndd	2·50	63	"	Armagh Observatory	2·81	71
"	Lake Vyrnwy	4·46	113	"	Warrenpoint	2·48	63
"	Llangynhafal, P. Drâw	2·73	69	"	Belfast, Cave Hill Rd.	4·54	115
"	Oakley Quarries	6·35	161	"	Glenarm Castle	4·38	111
"	Dolgelly, Bryntirion	5·89	150	"	Londonderry, Creggan	4·08	104
"	Snowdon, L. Llydaw	12·42	315	"	Sion Mills	3·98	101
"	Lligwy	3·61	92	"	Milford, The Manse	4·19	106
XII.	Stoneykirk,ArdwellHo.	4·28	109	"	Narin, Kiltoorish	..	..
"	Carsphairn, Shiel	5·80	147	"	Killybegs, Rockmount	8·19	208

Fortrose for September 0·67 in.

Climatological Table for the

STATIONS	PRESSURE: Mean M.S.L.	PRESSURE: Diff. from Normal	TEMPERATURE, Absolute: Max.	Date	Min.	Date	TEMPERATURE, Mean Values: Max.	Min.	½ max. and min.	Diff. from Normal
	mb.	mb.	° F.		° F.		° F.	° F.	° F.	° F.
London, Kew Observatory	1014·8	−1·1	75	24	36	5	64·4	45·7	55·1	+1·7
Gibraltar	1014·6	−0·3	78	31	54	18	71·6	57·8	64·7	−0·6
Malta	1013·5	−0·2	77	16	51	6, 10	70·6	60·5	65·5	+0·4
Sierra Leone	1010·5	−1·2	92	1, 2, 17	65	31	87·7	70·0	78·9	−3·0
Lagos, Nigeria	1011·8	+0·8	89	4	72	17	84·5	75·6	80·1	−1·1
Kaduna, Nigeria	1013·2	+3·6	97	12	66	9,29,30	88·2	70·2	79·2	+0·1
Zomba, Nyasaland	1014·5	+0·2	81	3	51	17, 21, 22	73·4	55·9	64·7	−1·0
Salisbury, Rhodesia	1015·2	−2·9	81	1	41	30	71·2	49·5	60·3	−0·2
Cape Town	1019·7	+1·8	88	4	42	28	71·3	53·4	62·3	+3·7
Johannesburg	1020·4	0·0	67	14	35	28	61·2	43·8	52·5	−1·9
Mauritius	..	..	..	..	..	..	..	..	..	..
Bloemfontein	..	..	71	14	29	31	63·8	40·2	52·0	−0·7
Calcutta, Alipore Obsy.	1000·4	−3·1	102	24	72	4	97·1	81·3	89·2	+3·2
Bombay	1006·3	−1·4	94	12	79	9	92·5	81·5	87·0	+1·3
Madras	1002·8	−2·6	111	25	77	1	104·4	83·2	93·8	+3·9
Colombo, Ceylon	1008·2	0·0	90	23	71	26	88·2	79·4	83·8	+1·0
Hong Kong	1007·3	−2·1	87	4	70	28	81·3	74·1	77·7	+0·3
Sandakan	..	..	92	14	74	1	88·4	76·3	82·3	−0·3
Sydney	1017·7	−0·9	77	2	41	27	68·1	55·3	61·7	+3·2
Melbourne	1018·0	−1·2	81	5	39	29	63·5	48·3	55·9	+1·9
Adelaide	1016·4	−3·7	89	4	45	8	71·3	55·4	63·3	+5·6
Perth, Western Australia	1010·3	−8·4	80	2	47	18	69·1	55·8	62·5	+2·1
Coolgardie	1012·4	−7·4	85	3	41	19	68·5	52·6	60·5	+2·9
Brisbane	1017·5	−1·4	80	19	46	27	75·2	57·2	66·2	+1·8
Hobart, Tasmania	1017·1	+1·8	78	5	33	26	58·3	44·1	51·2	+0·8
Wellington, N.Z.	1019·6	+4·4	64	27	37	9	57·4	47·7	52·5	−0·3
Suva, Fiji	1013·5	+0·7	88	Sev.	67	19	87·3	72·0	79·7	+3·2
Kingston, Jamaica	1012·8	−0·5	91	10	70	7	86·8	72·2	79·5	−0·2
Grenada, W.I.	1012·3	−0·3	88	24	71	3	84·8	73·8	79·3	−0·2
Toronto	1016·6	+1·8	87	21	33	17	70·3	49·7	60·0	+7·3
Winnipeg	1016·7	+2·4	85	27	23	14	66·9	41·6	54·3	+2·7
St. John, N.B.	1015·6	+1·6	79	22	30	6	60·1	41·2	50·7	+3·0
Victoria, B.C.	1016·4	0·0	72	30	39	3	59·3	44·6	51·9	−1·2

LONDON, KEW OBSERVATORY.—Mean speed of wind 7·1 mi/hr, 2 days with hail, 3 days with thunder heard, 1 day with fog.

GIBRALTAR.—3 days with thunder heard.

MALTA.—Prevailing wind direction E, 1 day with fog.

SIERRA LEONE.—Prevailing wind direction SW, 9 days with thunder heard.

COLOMBO, CEYLON.—Prevailing wind direction SW ; mean speed 7·2 mi/hr ; 6 days with thunder heard.

BRISBANE :—										
December 1920	1010·2	−1·6	97	17	64	10	87·0	69·1	78·1	+1·[illegible]
Year 1920	1015·9	+0·2	97	Dec.17	41	July13	77·3	60·1	68·7	−0·[illegible]
Corrected values for Suva, Fiji, Jan.–Apl. 1921. Jan.	1005·9	−1·8	90	5	71	2	86·3	73·1	79·7	−0·[illegible]
Feb.	1009·3	+1·6	90	9, 11	70	23	87·0	74·4	80·7	+0·[illegible]
Mar.	1008·6	+0·1	91	19	70	30	87·5	72·8	80·1	0·[illegible]
Apl.	1009·3	−1·3	89	17	68	16	85·8	71·6	78·7	0·[illegible]

Brisbane.—Max. temp. in sun :—Dec., 156 ; Year, 156.

British Empire, May 1921.

TEMPERATURE Mean	TEMPERATURE Absolute	Relative Humidity	Mean Cloud Am'nt	PRECIPITATION Amount		PRECIPITATION Diff. from Normal	PRECIPITATION Days	BRIGHT SUNSHINE Hours per day	BRIGHT SUNSHINE Percentage of possible	STATIONS
Wet Bulb.	Min. on Grass									
° F.	° F.	%	0–10	in.	mm.	mm.				
51·5	26	67	5·5	0·98	25	− 19	16	7·4	48	London, Kew Observatory.
59·7	49	75	3·8	1·39	35	− 10	5	..	..	Gibraltar.
62·1	50	74	4·1	0·56	14	+ 4	5	9·2	66	Malta.
75·5	..	71	5·6	6·21	158	−128	13	..	..	Sierra Leone.
78·5	68	94	6·8	21·55	547	+284	21	..	..	Lagos, Nigeria.
74·7	..	91	..	5·81	148	− 38	11	..	..	Kaduna, Nigeria.
..	..	87	4·7	1·47	37	+ 12	6	..	..	Zomba, Nyasaland.
54·5	39	67	4·5	2·52	64	+ 52	8	..	..	Salisbury, Rhodesia.
56·9	..	65	3·1	0·34	9	− 92	2	..	..	Cape Town.
44·7	32	69	3·5	1·15	29	+ 11	7	7·6	70	Johannesburg.
..	..	..	..	..	..	..	..	..	..	Mauritius.
45·3	..	82	2·2	2·91	74	+ 44	5	..	..	Bloemfontein.
81·9	71	56	3·5	3·01	76	− 70	3	..	..	Calcutta, Alipore Obsy.
78·2	75	63	2·3	0·00	0	− 18	0	..	..	Bombay.
77·8	..	70	3·2	0·00	0	− 27	0	..	..	Madras.
79·8	70	72	7·8	5·09	129	−182	21	..	..	Colombo, Ceylon.
74·5	..	86	8·8	33·79	858	+561	25	2·9	22	Hong Kong.
77·3	..	80	..	4·61	117	− 35	8	..	..	Sandakan.
57·9	32	76	6·0	7·28	185	+ 59	20	4·1	39	Sydney.
53·2	35	77	5·9	2·73	69	+ 14	14	..	..	Melbourne.
55·5	35	59	6·0	4·57	116	+ 47	11	4·3	42	Adelaide.
58·9	38	78	7·0	10·56	268	+148	25	..	..	Perth, Western Australia.
57·4	38	69	6·6	3·98	101	+ 66	15	..	..	Coolgardie.
62·2	39	72	4·8	0·75	19	− 55	11	..	..	Brisbane.
46·8	29	76	5·7	1·23	31	− 16	14	..	..	Hobart, Tasmania.
..	29	82	8·3	2·62	67	− 53	20	3·3	33	Wellington, N.Z.
72·4	..	88	..	8·86	225	− 33	19	..	..	Suva, Fiji.
..	..	71	5·5	5·61	142	+ 32	13	..	..	Kingston, Jamaica.
74·1	..	71	4·0	3·26	83	− 35	15	..	..	Grenada, W.I.
51·9	28	72	4·8	1·88	48	− 28	12	..	..	Toronto.
49·0	..	66	3·7	1·76	45	− 12	9	..	..	Winnipeg.
46·0	27	74	5·2	1·80	46	− 48	10	..	..	St. John, N.B.
46·8	32	76	4·2	1·47	37	+ 4	7	..	..	Victoria, B.C.

HONG KONG.—Prevailing wind direction ESE; mean speed 9·7 mi/hr; 15 days with thunder heard.

ADELAIDE.—Max. temp. and mean max. and min. temp., highest on record.

PERTH, W. AUSTRALIA.—Heaviest rainfall for May since 1879.

COOLGARDIE.—Heaviest rainfall on record for May.

WELLINGTON, N.Z.—1 day with thunder heard.

GRENADA.—Prevailing wind direction E.

										BRISBANE :—
..	56	59	3·8	2·57	65	− 63	5	..	..	December 1920.
..	34	64	4·7	39·74	1009	−170	122	..	..	Year 1920.
77·7	..	87	6·2	20·49	520	+248	23	..	..	Jan. } Corrected values for Suva, Fiji, Jan.–Apr. 1921.
79·0	..	83	5·1	11·38	289	+ 32	23	..	..	Feb.
76·5	..	80	..	17·12	435	+ 62	24	..	..	Mar.
73·3	..	85	..	27·02	686	+399	20	..	..	Apl.

SUVA.—Days with thunder heard: January, 14, February, 7, March, 5.

causing the water to break in waves against the houses. The velocity of the wind recorded at the Oficina Meteorologica Argentina was 40 miles per hour at 8 h., 45 miles per hour at 14 h., and reached 47 miles per hour at 20 h. The damage done was immense; many houses collapsed, and loss of life was narrowly averted; the docks were completely flooded and new works largely destroyed, and there has been much damage to shipping. It is stated that at the time of the flood in Buenos Aires there was an exceptionally low tide in Montevideo, near the mouth of the estuary.

In Eastern Australia satisfactory rains have fallen, and crop and pasture prospects are good.

The rainfall of the month was below the average generally in the south-eastern half of the British Isles, the areas with more than the average lying mainly in the north-west of Ireland and west of Scotland. As much as 50 per cent. in excess was reached locally in these regions. Less than half the average fell generally south of a line from the Bristol Channel to the Wash, and only about 10 per cent. of the average fell in the south of Kent. Less than 25 mm. (1 in.) was confined to the south of England, less than 12 mm. (0·5 in.) falling along the coasts of Kent and Essex. More than 100 mm. (4 ins.) fell over considerable areas in north and central Wales, the English Lake District, the west and north of Ireland, and more widely in the west of Scotland. More than 250 mm. (10 ins.) occurred in Snowdonia, Connemara, and over a large part of the Western Highlands of Scotland. At Loan, near Loch Quoich, as much as 546 mm. (21·50 ins.) was recorded. On the 20th heavy rain fell during a thunderstorm in isolated areas in the south-east of England, when 62 mm. (2·54 ins.) was recorded at Horsmonden, near Tunbridge Wells.

For the nine months, February to October, a considerable area in the south of England has had less than half the average rainfall. The area concerned lies south of a line from the Bristol Channel to the Wash, and roughly coincides with the area which had less than half the average rainfall in October.

The general rainfall for October, expressed as a percentage of the average, was:—England and Wales, 51; Scotland, 105; Ireland, 92; British Isles, 80.

In London (Camden Square) the mean temperature was 56·2° F. or 6·0° F. above the average and the highest for October in the 64 years' record. Duration of rainfall, 8·5 hours; evaporation, 0·72 inch.
